Find Articles You Need:
Searching PubMed®/MEDLINE® Effectively

National Library of Medicine
http://www.nlm.nih.gov/

NLM Resources

Advanced PubMed Searching Resource Packet: http://nnlm.gov/training/resources/pubmedpacket.pdf
Find Articles You Need: http://nnlm.gov/training/resources/pubmed8.pdf
MedlinePlus® for Health Professionals: http://nnlm.gov/training/resources/mp4hptri.pdf
NLM PubMed Online Training: http://www.nlm.nih.gov/bsd/disted/pubmed.html
NN/LM Non-English Guides to PubMed: http://nnlm.gov/training/resources/intlpubmedlinks.html
There's More to PubMed/MEDLINE: http://nnlm.gov/training/resources/myncbi8.pdf

This project has been funded in whole or in part with Federal funds from the National Library of Medicine, National Institutes of Health, Department of Health and Human Services, under Contract No. HHS-N-276-2011-00005-C with the University of Illinois at Chicago.
Revised November 2013.

National Library of Medicine
http://www.nlm.nih.gov/

The National Library of Medicine (NLM) is the world's largest medical library and focuses on medicine and related sciences. NLM is part of the United States Department of Health and Human Services, National Institutes of Health (NIH). NLM collections include more than seven million books, journals, technical reports, manuscripts, microfilms, photographs, and images. Online databases include genetics, consumer health, environmental health and toxicology, and literature citations.

PubMed®

The PubMed literature citation database was developed by the National Center for Biotechnology Information (NCBI) at NLM and is one of many NCBI databases. Since 1996, free access to MEDLINE has been available via PubMed. Coverage is worldwide, but most records (86%) are from English-language sources and/or have English abstracts. PubMed provides links to the full-text of articles at participating publishers' Web sites and from the national full-text archive, PMC.

PubMed contains over 23 million bibliographic citations back to 1809; the indexing of citations began in 1948 with Index Medicus. PubMed is updated Tuesday through Saturday. PubMed also includes links to biological and sequence data in the NCBI molecular biology databases and to chemical information in the PubChem databases.

Citations in PubMed

Most records are initially supplied electronically by publishers and are immediately made available via PubMed. They will have the status tag: **[PubMed - as supplied by publisher]**. Articles that are not yet available in print will include in the citation: **[Epub ahead of print]**.

Citations go through a quality control process. At the **[PubMed - in process]** step, medical indexers add 12 to 16 Medical Subject Headings (MeSH) terms to selected citations, as well as links to other databases and information sources. MeSH is NLM's controlled vocabulary (keyword database). Records are also checked for bibliographic accuracy. Next, indexed citations become MEDLINE records with the tag: **[PubMed - indexed for MEDLINE]**. Within two months, 50% of citations move from submission to fully indexed; the length of time depending on the journal. A relatively small number of records are included in PubMed but are not selected for MEDLINE; these contain the status tag: **[PubMed]**.

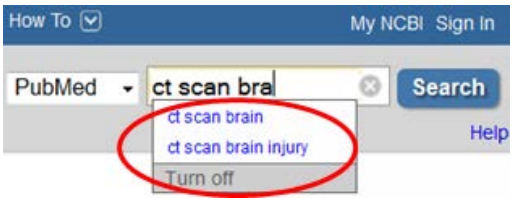
MEDLINE®

MEDLINE is the indexed subset of PubMed and contains nearly 21 million bibliographic citations on topics including microbiology, delivery of health care, nutrition, pharmacology and environmental health in the areas of anatomy, organisms, diseases, psychiatry, and psychology. MEDLINE makes up 90% of PubMed.

Over 5,600 biomedical journals are currently indexed by NLM for MEDLINE. Journals are selected by the Literature Selection Technical Review Committee (LSTRC). Considerations for inclusion are the scope and coverage of the journal, the quality of content and editorial work, production quality, the audience addressed, and the type of content. For more details, see the NLM Fact Sheet *MEDLINE Journal Selection* at: http://www.nlm.nih.gov/pubs/factsheets/jsel.html.

Searching PubMed

Enter significant search terms in the search box (e.g., ***ct scan brain aneurysm***) and click on the **Search** button. As you type, PubMed offers suggestions – but these are based on searches made by other researchers; they may NOT accurately reflect an effective PubMed search on your topic. Turn off the autosuggest by clicking "Turn off" or permanently turn it off when signed into My NCBI.

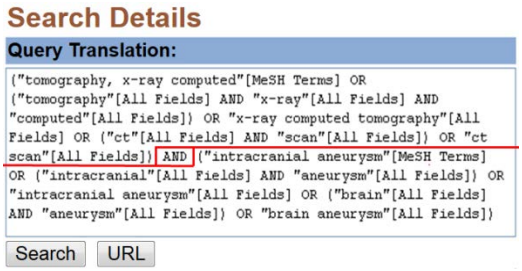


PubMed uses **Automatic Term Mapping** to translate the search. The terms are mapped against:

1) MeSH Translation Table (headings, subheadings, publication types, entry terms (synonyms), etc.);
2) Journals Translation Table (title, abbreviation, International Standard Serial Number ISSN, etc.);
3) Authors and investigators translation tables and indexes.

If no match is found, PubMed breaks apart the long phrase from right to left and repeats the Automatic Term Mapping process until a match is found. Terms that don't map will be searched in **All Fields**. Terms in a phrase will also be searched individually as **All Fields** and be combined (ANDed) together.

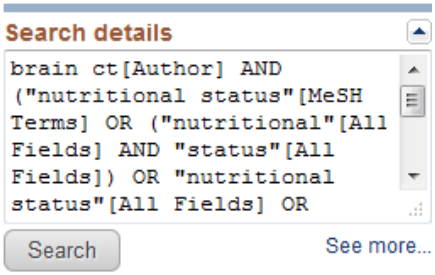
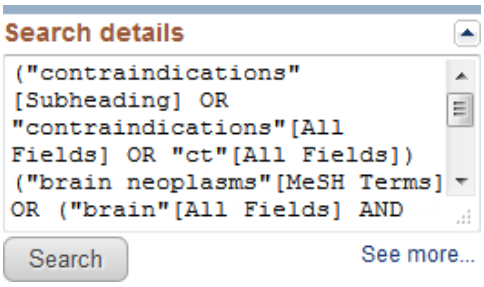
- **ALWAYS check Search Details after a search to see how PubMed tried to improve the search.**

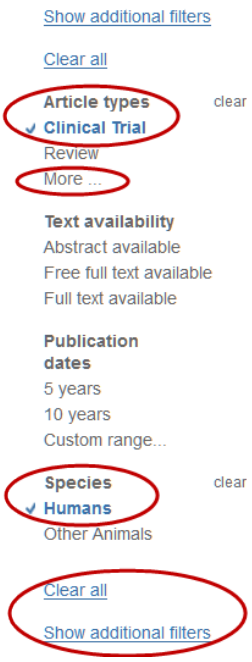


In the case of ***ct scan brain aneurysm,*** the long phase was broken into two separate segments: **ct scan** AND **brain aneurysm**

Scroll down the right hand column and review **Search Details** to verify PubMed performed the search you expected. Click **See more** to access the Query Translation box. Make needed changes in the Search Details screen and rerun the search.

Example: How does PubMed perform these two searches?

A. Search for: *brain ct nutrition*	**B. Search for: *ct brain cancer***
View **Search details**. Instead of nutrition issues related to brain cat scans:  • ***brain ct*** was mapped to the author: **Dr. CT Brain** (PubMed broke apart the search, found a match for the next phrase ***brain ct*** **.**) • ***Nutrition*** was mapped to **Nutritional Status**	 • ***ct*** was mapped to the subheading, **contraindications**. (Subheadings may be used to focus searches.) • ***brain cancer*** is a MeSH synonym and was mapped to **brain neoplasms**.



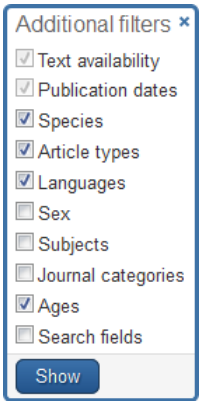
Focus Your Search with Filters

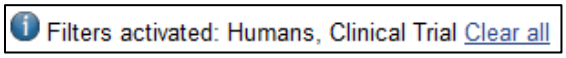
Use the filters in the left navigation menu to focus the search. Click on a filter to activate it; PubMed applies the filter and recalculates the search results. A check mark indicates an active filter.

- **Article types:** Limit to specific articles such as clinical trials and/or reviews; Click **More …** to see additional Article type filters
- **Text availability:** Check with your librarian before using this filter; you may eliminate items available to you through your library
- **Publication dates:** Limit to a specific time period or click **Custom range**
- **Species:** Limit to human-focused or animal-focused research

Show additional filters: Click this link to access additional filters; Check desired box(s) for filter(s) to appear in the list of filters; Click **Show;** Finally, click the now visible filter link to activate it.

- **Languages:** Limit to a specific language
- **Sex:** Limit to citations focusing on males or females
- **Subjects:** Limit to specific topics including AIDS, cancer, systematic reviews, toxicology and veterinary science
- **Journal categories:** Limit to, for example, nursing or dental journals
- **Ages:** Limit to a specific age group
- **Search fields:** Click Choose and use the drop-down menu to limit to a specific search field such as Author, Journal or MeSH Term

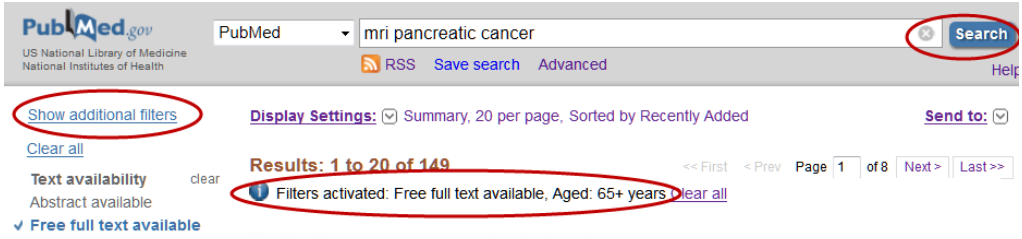




The **Filters activated** information line will appear on the search Results page and update as additional filters are added. Clear individual filters by clicking **clear**. Use any **Clear all** link to remove all active filters.

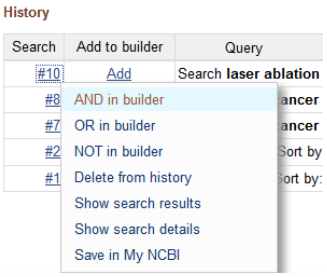
Example: Find free full-text articles about MRIs on seniors with pancreatic cancer.

- **Clear** search box if necessary and enter ***mri*** and ***pancreatic cancer*** in any order; click **Search**
- Check for **Filters activated**; click **Clear all** or clear unwanted filters
  - Under **Text availability,** click **Free full text available** to find to citations free to everyone, everywhere
  - Click **Show additional filters**, check the **Ages** box, then click **Show.**
  - Click **Aged: 65+ years**

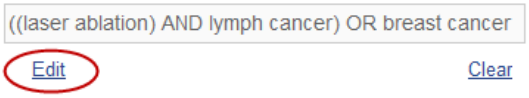


PubMed Advanced (Search)

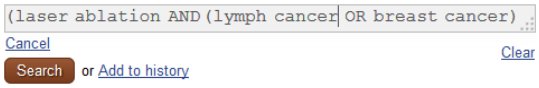
Use the search **History** to combine individual searches. ***Example: find articles on laser ablation in cases of breast or lymph cancer.***



- Search each term individually; in this case, *breast cancer* (#7), *lymph cancer* (#8), and *laser ablation* (#10)
- Remember to check **Details** after each search
- Click on the number, then the AND, OR, or NOT (Boolean operator) to add each term to the search
- Check the **Search Builder** box to see if PubMed added the parentheses the way you expected

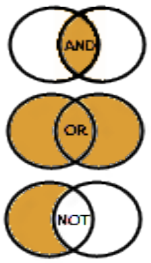


- Click **Edit** to make corrections as needed



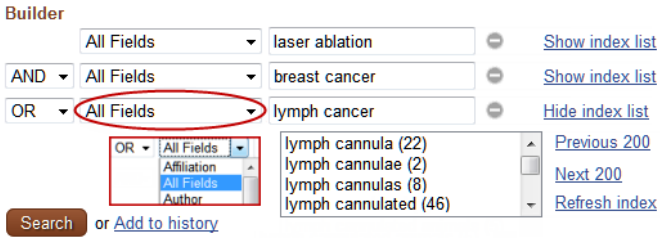
- Click **Search** to complete the process; you will retrieve about 900 items.

Using Boolean Operators: AND, OR, and NOT



- The default Boolean operator is AND; Use upper case (e.g., *x-ray OR mri*)
  - PubMed processes the AND and OR Boolean operators from left-to-right
  - The NOT operator is processed first
- AND – Both words must be present in the document
- OR – Either one or both of the words must be present in the documents
- NOT – Documents which contain the first word, but not the second

---



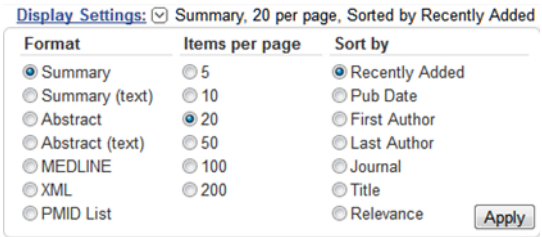
Builder

- Use the Builder to add terms, click **Search**
- Use the first drop-down menu to select a field (e.g. Author, MeSH)
- Use **Show index list** to find and add terms to the search

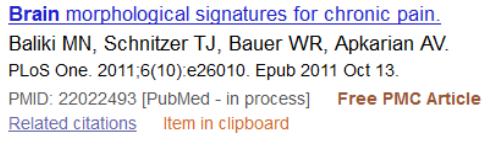
---

Display Settings

Select the format, number of items and order in which you want the citations to be displayed, then click **Apply.**



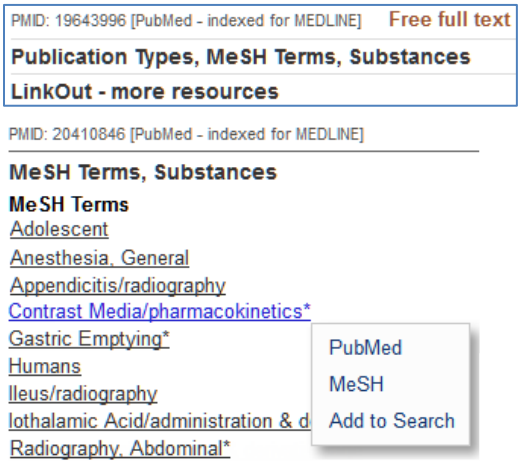
- **Format:** Only the *Summary* and *Abstract* formats link to additional resourses; The remainder of the formats appear as text. Use the MEDLINE format when downloading to a citation manager program.



  - **Summary Display** provides links to the citation, to *Related citations*, and to the *Item in clipboard* when applicable; Some citations include a link to *Free article* or *Free PMC article*
  - **Abstract Display** includes the full abstract, links to selected full-text journal icons, to MeSH Terms (for MEDLINE citations), and to My NCBI library icons
- **Items per Page:** Reveal up to 200 items on a page for review or printing; the default is 20
- **Sort by:** Reorder citations by date, author, journal title, article title or relevance.

Examine Individual Citations

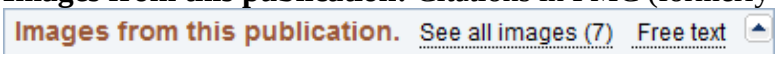
The Abstract format is the default for individual citations.



- **Abstract Supplemental Data** links to information on MeSH terms, publication types, substances, and grant support in Indexed for MEDLINE citations
  - Click on **MeSH Terms** to see how a citation is indexed; click on a specific MeSH term for more options
- **LinkOut – more resources** provides links to additional databases on related topics (e.g. to MedlinePlus)
- **Related information:** In the left navigation menu, this box includes links to related citations and to NCBI databases attached to the citation – including PMC

You may also see:

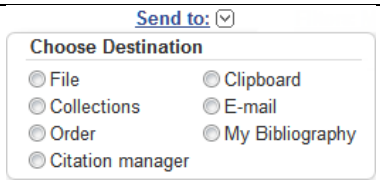
- **Images from this publication:** Citations in PMC (formerly PubMed Central) with images;



click **See all images**

- **Cited by xxx PubMed Central articles:** PMC citation listed a reference for other PMC citation(s)

Send to:

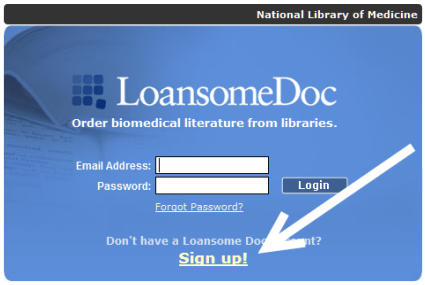


Options for saving citations include:

- **File:** Save a text version of the citation as a document
- **Collections:** Save citations permanently in My NCBI Collections
- **Order:** Order selected cititions through PubMed's LoanSome Doc® system
- **Citation manager:** Format selected citations to save as a file for a citation manager program
- **Clipboard:** Hold citations for up to eight hours
- **E-mail:** Email citations in any format to a specific address
- **My Bibliography:** Add selected citations to a personal My NCBI Bibliography

---

Order the Full Text of Articles



PubMed's offers **LoansomeDoc**, an article ordering system connecting health science library systems around the world.

- Go to: **https://docline.gov/loansome/login.cfm**
- **Sign up** by selecting and contacting a specific library

Once signed up, run a search in PubMed, check the box(es) next to the article(s) desired, then use ***Send to Order*** and click on ***Order articles.*** LoansomeDoc will contact the library with your rquest.

PubMed My NCBI

- Use *My NCBI* to save citations, to save search strategies, and to set personal preferences and filters
- Save a personal bibliography online, include presentations, and make this type of CV public
- While signed into My NCBI, searches and individually viewed items are stored for six months; From Recent Activity, past search strategies may be saved, and viewed citations added to a collection

PubMed Tools / More Resources (accessed from the PubMed Homepage)

- **Single Citation Matcher:** Easily find individual citations easily
- **Clinical Queries:** Pre-formatted search filters including clinical studies and systematic reviews
- **Topic-Specific Queries:** Search PubMed with specifically created topical filters
- **NLM Catalog:** Build journal and table of contents searches for PubMed

---

MeSH – Medical Subject Headings

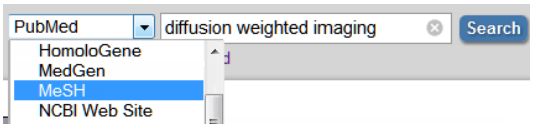
The MEDLINE Medical Subject Headings (MeSH) is a powerful tool that collects together citations on a specific topic – no matter what related term or keyword an author uses. For example, if one author uses CT X-ray; another: tomodensitometry; another: cine-CT; and still another: CAT scan; PubMed finds **all** of these citations using the MeSH term: **Tomography, X-Ray Computed**

Example: Find the MeSH term for "diffusion weighted imaging".

- Search PubMed for ***diffusion weighted imaging***

Note in **Search details** that PubMed does not recognize the phase and instead breaks it apart, searching for each term individually.

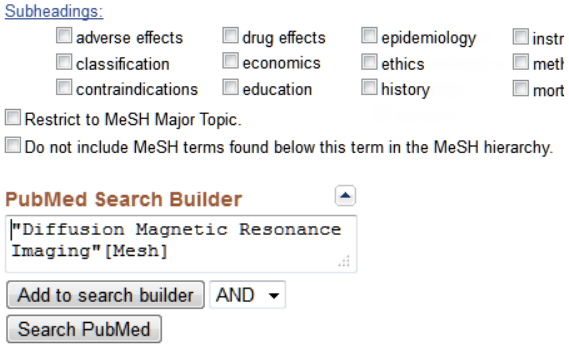
- Use the **MeSH** database to find the correct term.
  - Enter the phrase in the search box, select MeSH From the drop-down menu, click **Search**



  - PubMed MeSH shows the correct search term (the PubMed "keyword") to be **Diffusion Magnetic Resonance Imaging**

Select the Appropriate MeSH Term

- Review the definition of the term
- Options
  - Use the check box to select **Subheadings**
  - Check to restrict to citations where the term is the **MajorTopic** (or focus) of the article
- Click the **Add to search builder** button
- Optional: Search MeSH and add other terms
- Click the **Search PubMed** button to run the search



Additional hints

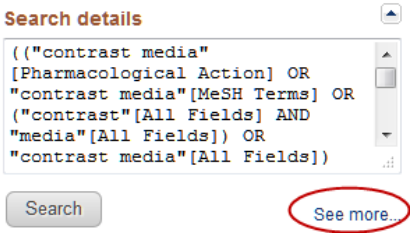
- A review the hierarchy tree may suggest broader or narrower terms for a search

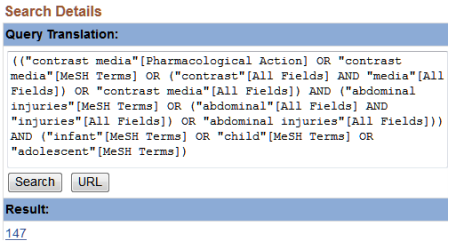
- If a term is not in MeSH
  1. Search for the term in PubMed (in quotation marks if necessary)
  2. Locate an [PubMed – indexed for MEDLINE] citation using the term
  3. Open the *Abstract Supplemental Data* of the citation by clicking on **MeSH Terms** and examine the MeSH terms assigned by an indexer

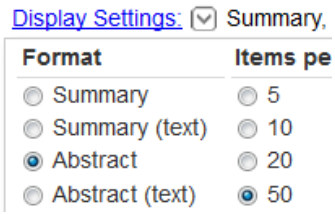
Exercises (Note: Be sure to try all of the examples first)

Exercise 1. Find articles about the effects of contrast media in children with abdominal injuries. View the MeSH headings for several citations.

- Enter the search terms ***contrast media*** and ***abdominal injuries***; click **Search**
- Clear all Filters if necessary; if the **Ages** filter is not visible:
  - Click Show Additional Filters
  - Check the box **Ages**, then Show
- Click **Child: birth-18 years** to activate the filter
- To view how PubMed handled the search – and to find additional search terms – click **See more** under **Search Details**







- To view the MeSH terms for a citation
  - Click **Display Settings** and **Abstract** under Format, then click **Apply**
  - Click on the **MeSH Terms** link below a citation to review MeSH terms for that citation
  - Click on a MeSH term, then use options in the box to view the definition in the MeSH database or to add the term to a PubMed search

---

Exercise 2.

Find MeSH terms for:

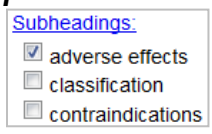
1. Mammogram
2. Gated Radionuclide Angiography
3. CCTA

Answers:

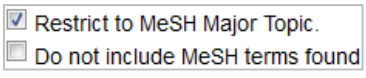
1. Mammography
2. Gated Blood-Pool Imaging
3. Unfortunately, CCTA (Cardiac Computed Tomographic Angiography) is not yet in MeSH. Use two terms: Coronary Angiography AND Tomography, X-Ray Computer

---

Exercise 3. Use the MeSH Database to identify articles discussing the adverse effects of MRIs in cancer patients. Limit these to articles focusing either on brain or breast cancer patients.



- In the MeSH database, search for ***MRI***; click the correct MeSH term. Under Subheadings, select the box for **adverse events**, then click **Add to Search builder**



- Still in MeSH, search for **brain cancer**. Check **Restrict to MeSH Major Topic** and use **Add to Search builder AND**
- Select the MeSH term for **breast cancer**, again check **Restrict to MeSH Major Topic**; but this time use **Add to Search builder OR**
- In the search box, adjust PubMed's default parentheses to reflect the correct search strategy

```
"Magnetic Resonance Imaging/adverse effects"[Mesh] AND
("Brain Neoplasms"[Majr] OR "Breast Neoplasms"[Majr])
```

- Click the **Search PubMed** button for ~12 results (Clear any filters that may still be applied.)